

T A B L E S

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O F T H E

V A R I O U S C O M B I N A T I O N S

A N D

S P E C I F I C A T T R A C T I O N

O F T H E

Substances employed in Chemistry.

B E I N G

A COMPENDIUM of that SCIENCE:

Intended Chiefly

For the U S E of those GENTLEMEN and LADIES

Who attend the AUTHOR's Lectures.

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OF THE

VARIATIONS OF COMBINATIONS

OF THE



A COMPANION TO THE

BRITISH MUSEUM

FOR THE USE OF THE

LIBRARY OF THE

BY JOHN WARR

LECTURE IN CHEMISTRY AND

LECTURE IN CHEMISTRY

T H E

Distinguishing PROPERTIES

O F T H E

CHEMICAL PRINCIPLES.

1  ACIDS* with Syrup of Violets produce *Red*.
 ALKALIS with Syrup of Violets produce *Green*.
 CALCARIOUS EARTHS are infusible: Argilaceous Earths when diluted with Water are elastic: and Crystalline Earths will not unite with an Acid.

PHLOGISTON is combustible.

AIR always appears in an elastic State.

WATER will not unite with the Phlogiston.

METALS are malleable, and resolvable into an Earth and the Phlogiston.

2. The *Vitriolic Acid* is colourless and scentless; it's Weight is to Water as 17 to 8; boils with a Heat which will melt Lead; fixes when the Mercury in *Farenheit's* Thermometer is at 35 Degrees; mixed with Water produces much Heat; attracts twice it's Weight of Water from the Atmosphere; $\frac{9}{7}$ of Sulphur is this Acid. In Proportion as it is diluted with Water (which it will bear in any Quantity) loses it's Attraction to oleaginous Substances.—Combined with Expressed Oils, forms *Volatile Vitriolic Acid*, and a *Volatile Oil* is generated by the Union. With Alcohol, forms *Rabel's Water*, and by the Union are formed *Æther* and *Oleum dulce*. With *Magnesia*, *Epsom Salt*. With *Cal. Earth* it forms *Selenites*; and with Argilaceous Earth *Alum*.

3. *Nitrous Acid* is of a yellowish fiery Colour; it's Vapours are remarkably pungent and suffocating; when mixed with Water it produces Heat and Bubbling, and changes to a bluish or green Colour, which in Time vanishes; when mixed with Snow it produces a greater

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* Acids in general also attract Water forcibly from the Atmosphere unite with most Substances, but especially with the more simple, and have very piercing Taste.

ter Degree of Cold. Its Weight compared with Water is as 6 to 4. Combined with Essential Oils forms *Essential Soap of Nitre*. With Alcohol *Dulcified Spirit* and *Nitrous Æther*. With the Muriatic Acid in different Proportions it forms *Aqua regia* (see the Table of Metals.)

4. *The Muriatic Acid* is of a reddish yellow Colour, but emits colourless Vapours; and has the Property of carrying up the Metals it is combined with in Sublimation.—When combined with Alcohol the Mixture is termed *dulcified Spirit of Salt*. With Zinc a *metalline Salt* and *Inflammable Air*. With Cal. Earth it forms *Liquid Shell*.

5. *The Vegetable Acid* differs from the Mineral Acids in being less fixed, not so susceptible of Concentration, weaker and more compounded. This Acid forms with *Arsenic Vinum Arsenicum*. With Antimony, *Vinum Ben. Antim.* With Magnesia, a *purging Salt*. With Water, common Vinegar.

6. *Alkalis* in general are of a white Colour and acrimonious fiery Taste; capable of Crystallization. The Vegetable and Volatile Alkalis when free from Water upon being mixt with it produce Heat. They attract Water from the Air, and with it become fluid; but the Fossile Alkali parts with it's Air, and dissolves without any sensible Heat. The Fixt Alkali evaporates in Part by boiling with Water, and the Volatile Alkalis intirely. Every Solution of an Alkali deposits Earth. The Volatile Alkali rises with a small Degree of Heat; the others fuse with a moderate one, in that State dissolving all Kinds of earthy Bodies, and with a suitable Heat change them into Glass, but especially Crystalline Earth; and if the Alkali is in a large Proportion, communicates its Properties to them. They unite with oleaginous Substances, which by that Union become miscible with Water. They unite with all the Acids, forming therewith different Neutral Salts.

The *Vegetable Alkali* forms with the Vit. Acid, Vitriolic Tartar, and a small Quantity of Epsom Salt. With the Nitrous Acid it forms Nitre. With the Muriatic Acid, it forms Digestive Salt of Sylvius. With the Vegetable Acid, Regenerated Tartar.

The *Fossile Alkali* forms with the Acid of Vitriol, Glaubers Salt. With the Nitrous Acid, Cubic Nitre. With the Muriatic Acid, Common Salt. With the Vegetable Acid, Sel de Saignette.

The *Volatile Alkali* forms with the Acid of Vitriol, Vitriolic Ammoniac. With the Nitrous Acid, Nitrous Ammoniac. With the Muriatic Acid it forms common Sal Ammoniac; and with the Veg. Acid, Vegetable Ammoniac.

7. The *Phlogiston* or inflammable Principle united to Bodies communicates to them neither Heat nor Light, but in other Respects alters their Properties considerably; in particular it renders them more fusible. It is transferable from one Body to another; in such an Operation both Bodies undergo considerable Alterations. The Inflammability of a Body is an infallible Sign that it contains a Phlogiston. It forms with the Vit. Acid, Sulphur. With the Muriatic Acid, Boyle's Phosphorus. With the Veget. Acid and Water, it forms Alcohol. The Phlogiston is never found perfectly free from other Substances. Metals owe their Malleability to this Principle.

8. The Air is an invisible, tasteless, inodorous, elastic Fluid. — Air is of two Sorts, *fixable* and *respirable*, but cannot come under our Examination, except in its elastic State. It is heavy, compressible, and by carrying off the Phlogiston from the Surface of hot inflammable Bodies, accelerates the Combustion.

9. WATER, as a Chemical Principle, is a transparent, colourless Body, devoid of Taste or Odour, and is fluid with a small Degree of Heat. Water is the most general Dissolvent in Nature, and enters into the Composition of all animal and vegetable Substances, and is also found in most Minerals, but not as a constituent Part. It dissolves a small Quantity of Calcareous Earth; Air; the imperfect Metals; all Saline Substances; Alcohol; Æther; Gas Sylvestrem; the more volatile Parts of Oils; Mucilages, &c. Sea Water contains four Sorts of Salt, (viz.) Common Salts, Sal Glauberi, Selenites, and Muria Calcarii. The common Salt contained in Water is about $\frac{1}{30}$; but in the Water of some Salt Springs $\frac{2}{5}$. — The Substances found in Mineral Springs are the Vol. Vitriolic Acid; Sulphur; Terrene Vitriolic Salts; Green, Blue, and White Vitriols; Glaubers Salt and Vitriolic Tartar; common Salt and Muria Calcarii.

10. METALLIC Substances form a Class of Bodies of the utmost Importance in *Chemistry*, *Medicine*, the *Arts* and *common Life*. These Substances have several remarkable Properties by which they are distinguished from all other Bodies. Earthy and stony Matters differ from Metallic Substances the least of any, as they approach nearest to them in Density; there is however a considerable Difference in that Respect. The heaviest Substance which is free from any Thing metallic is in Weight to the lightest Metal as 253 to 516.

Sulphur and Arsenic are most frequently found combined with Metals in the Bowels of the Earth, sometimes both together, and sometimes separately. Besides these the metallic Earths are generally intangled with hardened Clays, Calcareous Earths, Quarts, &c. from which

which they are to be separated either by Heat of suitable Fluxes; whence the Arts of *Smelting* and *Assaying*.

Gold, Platina, Mercury, Silver, and Copper, are sometimes found malleable, the rest always in the State of an Ore.

<i>Perfect Metals,</i>	Gold, Platina, Mercury, Silver.
<i>Imperfect Metals,</i>	Lead, Copper, Iron, Tin.
<i>Semi-Metals,</i>	{ Regulus of Antimony, Zinc, Bismuth, Reg. of Cobalt, Arsenic.
<i>Fusibility,</i>	{ Mercury, Tin, Lead, Silver, Gold, Cop- per, Iron, Platina.
<i>Tenacity,</i>	Gold, Iron, Copper, Silver, Tin, Lead.
<i>Hardness,</i>	{ Iron, Platina, Copper, Silver, Gold, Tin, Lead.
<i>Ductility,</i>	Gold, Silver, Copper, Iron, Tin, Lead.
<i>Reflect most Light,</i>	{ Platina, Steel, Silver, Gold, Copper, Tin, Lead.
<i>Specific Gravity,</i>	{ Gold, Platina, Mercury, Lead, Silver, Copper, Iron, Tin.
<i>Ditto of the Semi-Metals,</i>	{ Bismuth, Regulus of Antimony and Zinc the same.
<i>Fused or dissolved by Electricity,</i>	{ Iron, Brass, Silver, Gold, &c.

METALLIC CALXES are Metals deprived of their Phlogiston;

First, By burning out the Phlogiston in the open Air.

Secondly, By the Action of Acids upon the Phlogiston.

Thirdly, By Detonation with Nitre.

The more metallic Calxes are dephlogisticated the less fusible they are, the less volatile, less capable of dissolving in Acids, more transparent, render Alkalis caustic, and will not unite with Metals. When totally deprived of their Phlogiston are insipid, inodorous, and have no Action upon the Animal System; but may (if not too much deprived of the Phlogiston) be reduced to their respective Metals by a convenient Application of inflammable Substance.

11. GOLD may be dissolved by

<i>Aqua regia</i> composed of 4 Parts of Spirit of Nitre & one of Sal Ammo- niac; or Ni- trous Acid 3 Parts and Mu- riatic Acid one.	Will dissolve $\frac{1}{2}$ or $\frac{3}{4}$ of its Wt. of pure Gold, by a gentle Heat, and is called	A Solution of Gold in Aqua Regia; is yellow inclining to Orange; stains animal Sub- stances Violet; is	Decomposed by Fixt, or Volatile Alkalis; Calcarious Earths; Magnesia; Martial Vitriol, or those Sub- stances that will precipitate Metals from their Mensura. By Tin	<i>Aurum fulminans</i>; called also Calx of Gold, is of a yellowish Colour, and may be deprived of its fulminating Quality by the slightest Admixture of Sul- phur, is restored to Gold by simple Fusion.
<i>Hepar Sulphu- ris</i>, a Mixture by Fusion of Sulphur & the fixt Alkali.	Dissolves the Gold by Fu- sion.	Solution of Gold by Hepar Sulphuris; is miscible with Water, and gives it a very bitter Taste; decomposed	By Time the Vit- Acid combining with the fixt Alkali, forms	<i>Golden Precipitate of Cassius</i>, used in giving a fine Crimson to vitrified Substances. Vitriolic Tartar.
<i>Mercury</i>, by	Mixture	An <i>Amalgama</i> of Gold used in gilding Metals.	Decomposed by Evaporation.	Pure Gold and running Mer- cury.
<i>Æther</i>, made by decompo- sing ardent Spi- rit very highly rectified by concentrated Vit. Acid.	Addition to a solution of gold in Aqua Regia; after Agitation the Æther and Gold swim at the Surface, to be separated from the Acid by Decantation	<i>Aurum potable</i>; supposed to be a Liquor to prolong Life.		

Silver by Fusion produces a Mixt Metal; whitens the Gold much more than Copper, which rather tends to heighten it's Colour, and does not diminish it's Ductility so much; to be separated by dissolving one of them in their respective Menstrua.

Lead by continued Fusion scorifies all the imperfect Metals mixt with Gold; this Operation is called Cupellation. Antimony has the same Effect.

Gold is 19.639 Times heavier than Water. A Wire one tenth of an Inch in Diameter breaks with 430 Pounds. This Metal is indistructible, and of a yellow brilliant Appearance.

12. PLATINA may be dissolved by

<i>Aqua Regia</i> composed of equal Parts of the Nit. and Marine Acids; by	Addition and Digestion in a Sand Heat, will dissolve one sixteenth of it's Weight of Platina.	Solution of Platina in <i>Aqua Regia</i> ; is of a very deep Yellow, inclining to Orange; tinges Anim. Sub. of a Dun Colour.	Fixt or Vol. Alkalies precipitate it in a brick red Powder, and is restored to Platina by Heat, without Addition. — Sal Ammo. disengages it from the Menstruum; most Metals precipitate it in it's metallic Form
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Hepar Sulphuris dissolves Platina by Fusion.

Platina is difficult to fuse alone, but melts readily when mixt with other Metals.

With *Gold* in equal Parts, runs smooth, is whitish, hard, breaks with a smart Blow, but when nealed extends considerably under the Hammer; with $\frac{1}{3}$ of Platina it may be beat into thin Leaves without fracturing, and pales the Gold no more than $\frac{1}{12}$ of Silver.

With *Silver* in equal Parts, hard, more sonorous than Silver, has a coarse Grain but preserves some Degree of Malleability; a smaller Proportion of Platina produces a Colour approaching nearer to Silver, however it's Texture and Beauty are always injured by it.

With *Copper* in equal Parts is hard, harsh, and coarse grained, but from a Sixth to $\frac{1}{3}$ of Platina is of a beautiful Rose-colour, very malleable

malleable and hard, takes a better Polish than pure Copper, the Texture is smooth, not so liable to calcine and change to Verdegris.

Unwrought *Iron* with $\frac{1}{2}$ of *Platina*, a Compound much harder than *Iron*, capable of receiving a fine Polish, and not so liable to rust as *Iron* alone.

Tin from equal Parts to $\frac{1}{2}$ of *Platina*; a Compound very hard, harsh, and coarse.

Lead a Compound as with *Tin* if the Proportion of *Platina* is great; is of a dark Colour, always having a violet or purple Cast.

Mercury amalgamizes with Difficulty.

Bismuth as with *Lead*; the Mixture always brittle.

Zinc unites readier with *Platina* than any of the Metals; the Compound in external Appearance differs little from pure *Zinc*, but if the Proportion of *Platina* is great it is of a coarser Texture, of a more cloudy Hue, and something bluer, harder and less malleable than that Semi-metal.

Regulus of Antimony in any Proportion, nothing remarkable.

Brass and *Platina* in equal Quantities; a Compound exceeding hard, brittle and compact, takes a fine Polish, and resists the Action of the Air, consequently is very proper for fabricating Mirrours for Telescopes.

Platina, White Gold or the Eighth Metal, is found only in the Spanish West Indies; is more than 18 Times heavier than Water; is indestructible; difficult of Fusion when pure.—The Grains of *Platina* have a livid metallic, white and fair shining Appearance; possessed at the same Time of the White of Silver blended with the Grey of *Iron*.

13. SILVER is soluble in all the Acids; which form Lunar Salts, according to the Acid employed.

Silver united with —

Nitrous Acid dissolves Silver readily, and in the Solution there falls a flaky Substance, supposed to be Gold with which the Silver is mixed. This Solution of Silver is at first of a green Colour, but afterwards becomes clear, is more corrosive than the Acid itself, and destroys Animal or Vegetable Sub. giving a lasting Black to the Skin.* By gentle Evaporation are formed Lunar Crystals, which by Fusion become the *Infernal Stone*, so called from it's black Colour. When precipitated by Sea-Salt mixt with Crystals of Tartar, is a Composition for *silvering* upon Brasses or Copper. Is decomposed by

* Is a proof Liquor to determine the Presence of the Marine Acid.

Detonation; or by a strong Heat which forces off the Acid, and the Silver is left behind.
By Addition of A *Lunar Vitriol*, but when Salts are used the same, and a fresh Salt according to the Basis with the Nitrous Acid.

Muriatic Acid decomposes the Lunar Nitre, applied either simple or combined with other Substances.

Luna Cornea; appears like Horn, and when cold is semi-transparent, is hardly soluble in Water.

Decomp. by Fixt or Vol. Alkalis, or Calc. Earth.

Calx of Silver; by Fusion it assumes it's natural Form without Addition, and is usually very pure.

Zinc, Iron, Copper.

Pure Silver.

Pitriolic Acid, highly concentrated, dissolves Silver and forms with it Lunar Vitriol.

Muriatic Acid unites with Silver by Cementation, when the Acid is in it's most concentrated and most active State, forming *Luna Cornea*. This Operation is called concentrated Depart, by which Silver is separated from Gold.

Sulphur

Sulphur is joined to Silver by Fusion and produces an { Silver in which is supposed as small Quantity of Copper, artificial Ore; continued Heat burns out the Sulphur and { as it gives a green Colour to Vol. Spirit of Urine. leaves

Copper is found in a small Quantity in native Silver and is to be freed from it by treating it with { *Pure Silver* and Nitre and Lead; the Residuum is *Scoria*.

Gold and Silver are separated by a { Nitrous Acid called Quantation; *Lunar Nitre* and pure Gold. Menstruum, which will dissolve one but { Muriatic Acid called Cementation; *Lunar Cornua* and pure Gold. not the other. Sulphur uniting with Silver but not { Pure Gold and Sulphurated Silver. with the Gold.

Silver has a white shining Appearance; harder and more sonorous than Gold; melts with a less Heat; is indestructible, Air and Water have no Effect in changing its Colour; but the Phlogiston soon discolours it. A Wire one tenth of an Inch Diameter breaks with 235 lb.

14. MERCURY unites with —

Vitriolic Acid unites with Mercury by Distillation, and forms *Mercurial Vitriol*, soluble in Water; and *Turbith Mineral* not be to united with Water; but these two, being recohobated together form a { A Disunion effected by a greater Heat than will raise Mercury by itself; or Addition of an Alkali, Calc. Earth, or any Metal that has a greater Attraction to the Acid, forming *Mercurial Precipitates*, or running Mercury.

Muriatic

Muriatic Acid unites with Mercury by Addition and Assistance of Heat; the Acid disengaged from a fixt Basis and raised with the Mercury, Forms

Corrosive Mercury, Corrosive Sublimate; it crystallizes in Spicula crossing each other; it preserves it's Causticity to an amazing Degree; is not deliquescent; requires warm Water to dissolve it, and may be resublimed without Decomposition. Disjoined by

Fixt Alkalis.
Vol. Alkalis.
Lime Water.

A reddish Powder.
A whitish Powder.
A brick red Powder.
The Colour of Precipitates depends upon the Degree of Division, and Quantity of Saline Substance and Phlogiston remaining.

Distilled with Tin a little coming over.

Forms with the Mur. Acid the *Fuming Spirit of Libavins.*

Corrosive Sublimate and Mercury ground together.

Takes up $\frac{3}{4}$ of its Weight of Mercury, appears blackish.

Being resublimed, forms *Sweet Sublimate*, having lost most of its Causticity and is not soluble in Water.

After six or seven Sublimations becomes *Calomel*, not soluble in Water.

Distillation with Crude Antimony.

Butter of Antimony and Cinnabar.

Any Metal that will precipitate Mercury is dissolved by the Acid, forming therewith

Nitrous

Nitrous Acid unites with Mercury forming *Mercurial Nitre*; is corrosive, and blackens Animal Substances; is decomposable by

Exposure to Heat; as the Acid quits it, a gradual Change ensues to a Yellow, Orange, or Red Colour.

Spirit of Wine burnt upon it.
Vit. Acid or any of the Vitriolic Salts.

Red Precipitate, used in Surgery.

Arcanum Corallinum.
Turbith Mineral and Nitre according to the Basis of the Vitriolic Salt.

This is a Proof Liquor to determine the Presence of the Vitriolic Acid.

Muriatic Acid forming an Aqua Regia in which Mer. is not soluble.

Any of the Substances which will decompose Cor. Sub. or Mercurial Vitriol.

By forming with it Turbith Mineral.

A White Precipitate which is M. Cor. and will be suspended by adding more Acid.

According to the Substance used.

Sulphur ground with Mercury or poured into it melted, form *Ethiops Mineral*; is of a blackish Colour.

To procure an intimate Connection, they are to be sublimed several Times together, when they form Artificial *Cinnabar*, which pulverized is *Vermilion*.

Fixt Alkali,
Cal. Earth.

Copper, Lead, Silver or Reg. of Ant.

Burning in the open Air will decompose *Cinnabar*; or applying any of the Substances which decompose *Ethiops Mineral* — Iron is usually employed.

Mercury and *Hepar Sulphuris*.

The Intermediums sulphurated.

Gold and Mercury form an Amalgama for gilding; Heat raises the Mercury from the Gold.

Mercury also unites with Silver, Lead, Tin, Copper, Zinc, *Regulus of Antimony*.

Oils triturated with Mercury form *Mercurial Unguents*.

Fix

Fixt and *Vol. Alkalis* unite, the *Mer.* being first divided by an Acid, and more Alkali added than is sufficient to saturate the Acid: The *Vegetable Acid* is treated in the same Manner with the Alkalis.

Mercury is formed into a reddish Powder by long and constant Heat called *Mercurius calcinatus*.

Mercury is 13,565 Times heavier than Water; has been fixed by Cold, and was found malleable, and may at any Time be reduced to running Mercury from any of its Forms without Addition.

15. LEAD dissolved by —

Heat continued just sufficient to fuse the Lead.

Stronger.

Farther Continuation.

Stronger.

Yet stronger.

Lead Asbes, a grey Calx.
Massicot, a fine Yellow.
Minium a Red.
Litbrage.
Glass of Lead.

They all become Lead again by the Addition of an inflammable Substance in Fusion.

Nitrous Acid and Lead form.

Nitrum Plumbi, decipitates and detonates either with, or without Addition; decomposed

By either the Vit. or Muria-tic Acids pure, or any of their Salts.

Vitriol of Lead and *Muria plumbi* or *Nitre* according to the Basis.

Vegetable Acid in the State of Vapour corrodes Lead and forms *Ceruse*; used in Painting. Decomposed

A full Saturation; *Sacharum Saturni*; shoots into beautiful Crystals.

By Heat or the other Acids.

Radical Acetous Acid and a Met. Salt according to the Acid.

Sulphur

Sulphur by it's Fumes in the open Air calcines the Lead, but in close Vessels forms it into an artificial *Lead Ore*.

Oils and fat Substances decocted with it in a considerable Heat form Drying Oil used in Painting, and Emplastics of several Sorts; decomposed in some Degree by Water, to which they communicate a milky Colour.

Lead is an imperfect Metal, softest and least elastic of any; a Wire of one tenth of an Inch Diameter breaks with 25.25 lb. Is 11.325 Times heavier than Water, and melts before it is red hot.

16. COPPER altered by ———

Heat, when great enough to make Copper red hot, calcines the Surface, and by repeating the Operation the whole undergoes the same Change and is reducible by the Phlogiston.

Vitr. Acids aided by Heat and crystallized. $\left. \begin{array}{l} \text{Blue Vitriol decomposed} \\ \text{of Copper is produced;} \end{array} \right\} \begin{array}{l} \text{By Alkalis or Cal. Earth;} \\ \text{by Zinc, or Iron,} \\ \text{Malleable Copper.} \end{array}$

Muriatic Acid digested upon *Copper* dissolves it.

And Do. with a Solution of Sal Ammoniac form *Aqua Caelestis*.

Nitrous Acid unites with *Copper* and dissolves soon.

Vegetable Acid in a small Quantity corrodes the *Copper* $\left\{ \begin{array}{l} \text{Decomposed by Heat or any of the other Acids, Al-} \\ \text{and forms Verdegrys.} \end{array} \right. \left\{ \begin{array}{l} \text{kalis, or Cal. Earths, forming Calx of Copper.} \\ \text{Zinc or Iron, Copper.} \end{array} \right.$ — By
zation, Crystals of *Venus*.

Air

Air Water, Alkalis, Oils, Nitr. Sal Ammoniac, will corrode Copper and form a Species of Verdigris.

Sulphur fused with Copper form a Species of Copper Ore, may be decomposed by Iron which adheres to the Sulphur; continued Calcination the Residuum is Blue Vitriol.

Zinc fused with Copper form $\left\{ \begin{array}{l} \text{Brass, which by Calcination form} \\ \text{by Cementation} \end{array} \right\}$ Copper and Flowers of Zinc.

Copper is nine Times as heavy as Water; a Wire one tenth of an Inch in Diameter will break with 258lb. Is capable of almost as great an Extension as Silver; is an imperfect Metal, and has a peculiar Taste and Smell.

17. IRON dissolved by —

Heat when strong forms Iron into Astringent Safron of Mars.

Vitriolic Acid unites with Iron and forms Martial Vitriol, and Vol. Vit. Acid, with an inflammable Vapour; decomposed by

Nitrous Acid.
Muriatic Acid.

Fixt or Vol. Alkalis when pure.

If not totally dephlogisticated.

If it contains much Phlogiston.

Astringent Vegetables.

A Precipitate like Rust.

Ethiops Martial; is more or less of an Olive Colour.

Prussian Blue.

Various black Inks, supposed to be owing to a Quantity of Oil united with the Iron. Precipitates.

Calcar. Earth and Zinc.

Aqua

Aqua Regia, by Addition, is attended with Heat and Effervescence, produces Martial Nitre, Muria Ferri, and nauseous Vapours; this Salt is deliquescent—A Solution is greenish if the Acid predominates, but reddish if the Iron. { The same as under the Article Vitriolic Acid.

Tartar, mixed with Iron-filings in Water, produces Tincture of Mars tartarized.

Alkali in Solution poured to a Solution, of Iron in the Nit. Acid more than sufficient to saturate the Acid, forms Martial Tincture of Stahl; is almost red. Decomposed { By saturating the Alkali with any Acid.

Sulphur added to Iron of a white Heat forms mineralized Iron; more fusible than Iron only.

Iron separates Sulphur from any of the Metals by Fusion, in Consequence of their greater Attraction.

Sulphur unites with Iron in the wet Way, both being mixed with Water, producing Martial Vitriol, and inflammable Vapour; similar to the Decomposition of Iron Pyrites.

Nitre in Fusion, and Filings of Iron added, detonate; the Result is Crocus Martis of Zwelfer. Moist Air, in Contact with Iron, forms Crocus Martis, not reducible by the Pologiston.

Iron unites with all the Metals, except Lead and Mercury, and is convertible into Steel by Fusion with suitable inflammable Substances; or by Cementation.

Iron is of a greyish White Colour; is the only Substance we know in Nature capable of being attracted by the Loadstone, and by a peculiar Process may be converted into Magnets.

18. TIN,

18. TIN.

Heat continued, calcines the Tin to a grey Powder, is remetalized by Fusion with the Phlogiston.

A strong Heat with a free Current of Air; *Putty*; irreducible; is used in polishing, and Enamel.

Continued under a Muffle with a strong Heat for two Hours; the Contents of the Test will be { On the Top a white Calx vegetating;
next a red Calx; next a Glass like the
Hyacinth; at Bottom a Button of Tin.

Nitre and Tin detonate, discharging Arsenical Vapours and leaving calcined Tin.

Vitr. Acid diluted and Addition with Heat; *Vitrio. Jo-* { Decomposed as by the Table of Attractions.
vis and a sulphurous Vapour.

Aqua Regia;

Nitr. Acid;

Muriatic Acid unites with Tin by Addition with Heat, { Distillation; when the Union
or from Luna cornea, Cor. Sub. or Butter of Antimony; is formed from Corros. Sub. } Fuming Liquor of
form Muria Stanni; the Solution is very clear and transpa- } some of the Tin coming over. } Libavius.
rent; decomposed by

Sulphur forms with Tin by Fusion an artificial Tin Ore.

(19)

Mercury by Addition ; an Amalgama, used to foliate Mirrours.

Copper by Fusion ; Bell-metal, Bronze, &c.

Lead, so proportioned to the Tin as when cold to appear spotted, forms soft Solder, which runs with a Heat of about 350 Degrees of Farenheit's Thermometer ; Addition of Bismuth to this Solder forms one which runs with about 209 Degrees.

Tin is 7.32 Times heavier than Water ; a Wire one tenth of an Inch breaks with 42.5 lb. It's Colour is a little darker than Silver, is the softest of the Metals except Lead, and has it's peculiar Taste and Smell.

19. ZINC, a shining Mine-
 { Melts with a low red Heat, but { The Calx reducible again by the Addition of
 { calcines with a greater. { an inflammable Substance.
 Water, in some Degree mal- { Burns away with a white Heat, producing Philosophic Wool.
 leable, { Deflagrates with Nitre, and used in Fireworks produces a good Effect.

Vitriolic Acid, six Parts with it's Weight of Wa- { Dissolves with gentle Heat and leaves } White Vitriol.
 ter and one Part of Zinc, { no Sediment.

Zinc may also be dissolved in the Nitrous or Marine Acids ; and unites with any of the Metals or Semi-metals in this Order ; viz. *Copper* 3, Zinc one { Sheet Brass or Laiton.
Copper 2, Zinc 1 $\frac{1}{2}$ { Pinchbeck, Princes Metal, &c.

Iron, Silver, Gold, Tin, Lead.

Addition

Addition of Sulphur and Fat alternately frees Zinc in Fusion from any Alloy except Gold.

20. ARSENIC is sublimed in the
Cobalt-works; is soluble in 14 times
it's Weight of boiling or 30 of
cold Water.

White Arsenic or Ar-
senical Calx,

With the Phlogiston—*Reg. of Arsenic.*

With one-tenth of Sulphur.—*Yellow Arsen. Orpiment.*

With one-fifth of Sulphur, } *Red Arsen. Sandarach;*

when fused is transpa-

rent, called *Ruby Sulphur.*

Unites in this }
Order with

Iron, Copper, Tin, Lead, Silver, Gold.

Arsenic dispossesses Nitre of it's Alkali, taking Place of the Acid, forming *Arsenical perfectly Neutral Salt.*

21. ANTIMONY dissolved by—

Antimony; when
in it's Reguline
State seven Times
heavier than Wa-
ter, is

Native;
or
Purified

intangled with heterogeneous Substances.

Consists of *Reg.*
Ant. and mineral
Sulphur.

Calcin-
ed by a Antimo-
continual ny,
strong
Heat,

Calx of

Melted with a
stronger Fire, *Glass*
of *Antimony*; but
when brown and
untransparent, *Li-*
ver of *Ant.*

Either, treated
with the *black*
Flux, be comes
Regulus; by an
Addition of *Sulp.*
Crude Ant.

Marial, Cupreous, &c.

Fused with *Iron, Copper, Tin, Lead, or Silver,*

Reg. of Antimony.

Four Parts
detonated
with three of
Nitre, one of
Tartar, the
Residuum
fused,

Regulus of
Antimony at
Bottom and
Scoria at Top.

Calx of *Antimony* and the Phlogiston combined.
Which contain Alka-
lized *Nitre*, Alkalized
Tartar, Liver of Sulphur
which dissolves some of
the *Reg.* and Vitriolic
Tartar.

Dissolved by Water after
standing deposits a Sedi-
ment which is a Species of
Kermes Mineral; saturate
with any Acid deposits
Golden Sulphur of *Antimony*.

Fused with equal Parts of *Nitre*; Liver of *Antimony*; at Top *Scoria*; as above.

With three times
it's weight of *Nitre*.
Unwashed dia-
phoretic Antimony.
White Calx of *Antimony*
and a saline Mass.

In all Operations, where a strong Fire, is applied to *Reg. of Ant.* or it's Calx not
totally dephlogisticated, a Quantity of *Flowers of Antimony* rise,

Crude

Crude Antimony, boiled in a So- { *Kermes Mineral* com- } 5 $\frac{1}{10}$ of Sulphur, 2 of Regulus of Antimony, 1 $\frac{3}{10}$ of
lution of *Fixt Alkali*, deposits when } posed of about, } *Fixt Alkali*.
cold,

Regulus of Ant. & { Combined by } Sulphur, } Formed of the Phlogiston and Vitriolic Acid.
the *Vit. Acid*, { Distillation, } *Vol. Vit. Acid*, } The Phlogiston and Vitriolic Acid loosely combined.
A *saline Mass*.

Neither the *Nitrous* or *Muriatic* Acids dissolve Antimony, the *Nit. Acid* only corroding it, but an

Aqua Regia, formed of 4 { Addition in small Quantities ; the Acid dissolves one-sixteenth of its Weight of the Re-
Parts of *Nit. Acid* and } gulus of Antimony.
one of Marine, by

Corrosive Sublimate, dis-
tilled with Regulus of An-
timony, but with Crude
Antimony by Do.

Butter of Antimony, formed of
the reguline Part and Mur. Acid;
and by increasing the Fire to-
wards the End of the Operation
Running Mercury.
Butter of Antimony and Cin-
nabar.

Addition of much Wa-
ter separates the Acid from
the Reguline Parts which } *Powder of Algaroth* or
precipitate, } *Vital Mercury*.
If the Reg. yet remaining
is precipitated with an *Al-*
kali,

Philosophic Spirit of Vi-
triol.

Addition of the *Nit. A-*
cid three Times, and Eva-
poration, } *Bexoar Mineral*.

22. BISMUTH, Tin-glass, or, *Marcastita Officinarum* ; { Exposed to a sufficient Heat is semivolatile, Part rising
nine Times heavier than Water, is very fusible, } in *Flowers*, and Part calcines, is converted into *Litbrage*
and *Glass*, as is the Case with Lead.

Sulphur

Sulphur and Bismuth united form a striated Mineral which looks like Antimony.

Mercury so unites with it and *Lead* that all pass through the Pores of Leather.

Vit. Acid dissolves only the inflammable Part of it; and the Marine Acid dissolves but a little of it and with Difficulty; but

Two Parts of the *Nit.* } Water alone separates
Acid dissolve one of Bif- } the Bismuth in a beauti-
 } ful white Powder.

Bismuth will not unite with *Zinc* or *Arsenic*, but wrote with, and Hepar Sulphuris applied, renders the Letters with the other metallic Substances in this Order, } visible notwithstanding they were not to be seen before.

Iron, Copper, Tin, Lead, Silver, Gold, and all these Compounds, are rendered more fusible by Bismuth.

23. COBALT appears in a variety of Shapes, according to the Substances united with it. It is a ponderous Mineral finely striated and sometimes granulated, sometimes also smooth on the Outside, often of a light greyish Colour and Semi-metallic Appearance, and frequently of a blackish Dye. It contains a good Deal of Arsenic and a Quantity of a certain fixt Earth, which being melted with Flints and Fixt Alkali turns into Glafs of the finest Blue, inclining however a little to a violet Colour, called Smalt; and Cobalt most commonly contains Bismuth. Besides there is a Mineral called Flower of Cobalt, which is finely striated, not very compact, and is of a fine red Purple. It contains half it's Weight of Arsenic and a great Quantity of Bismuth, and gives Glafs the azure Colour. If when the Bismuth and Arsenic are separated, the Residuum called *Zaffre* is treated with suitable *Fluxes*, it produces a semimetallic Substance termed *Regulus of Cobalt*. In general Cobalt is worked only for the sake of it's colouring Matter.

